Stoller
Grand Junction Office established 1959

299-W22-23 (A7874)
Log Data Report

Borehole Information:

Borehole:	299-W22-23 (A7874)		Site:	216-U-12 Crib	
Coordinates (WA St Plane)		GWL[1] (ft) :	None	GWL Date:	07/02/03
North	East	Drill Date	TOC[2] Elevation (ft)	Total Depth (ft)	Type
134444.974 m	567586.716 m	08/60	694.33	307	Cable

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	2.10	8 5/8	8 1/8	0.25	+2.10	unknown

Borehole Notes:

The logging engineer measured the casing stickup using a steel tape. A caliper was used to measure the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape, rounded to the nearest 1/16 in.; casing thickness was calculated. Total depth (307 ft) is derived from Ledgerwood (1993); however, total logging depth was 241 ft. Ledgerwood reports the casing was perforated from 200 to 300 ft, and sand-filled to 242 ft after perforating. The logging engineer attempted to measure depth to water and the borehole was dry. Groundwater level was approximately 236 ft in December 1994. Coordinates and top of casing (TOC) elevation are derived from HWIS[3]. Logging data acquisition is referenced to the TOC.

Logging Equipment Information:

Logging System:	Gamma 2E		Type:	SGLS (70%) SN: 34TP40587A
Calibration Date:	03/03	Calibration Reference:	GJO-2003-430-TAC	
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3 Repeat		
Date	06/30/03	07/01/03	07/02/03		
Logging Engineer	Spatz	Spatz	Spatz		
Start Depth (ft)	51.0	242.0	63.0		
Finish Depth (ft)	3.0	50.0	39.0		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	1.0	1.0	1.0		
ft/min	N/A[4]	N/A	N/A		
Pre-Verification	BE051CAB	BE053CAB	BE054CAB		
Start File	BE052000	BE053000	BE054000		

Log Run	1	2	3 Repeat		
Finish File	BE0552048	BE053192	BE054024		
Post-Verification	BE052CAA	BE053CAA	BE054CAA		
Depth Return Error (in.)	0	+1	0		
Comments	Fine-gain adjustment made before logging.	Fine-gain adjustment made after files -131 and -163.	No fine-gain adjustment.		

Logging Operation Notes:

Spectral gamma logging was performed in this borehole between June 30 and July 2, 2003. Logging was conducted with a centralizer on the sonde, and measurements are referenced to TOC. A repeat section was collected in this borehole to evaluate system performance.

Analysis Notes:

Analyst:	Henwood	Date:	07/15/03	Reference:	GJO-HGLP 1.6.3, Rev. 0

Pre-run and post-run verifications for the logging system were performed before and after each day's data acquisition. The acceptance criteria were met.

A casing correction for 0. 25-in.-thick casing was applied throughout the borehole.

SGLS spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with an EXCEL worksheet template identified as G2EMar03.xls using an efficiency function and corrections for casing and dead time as determined from annual calibrations. Dead time and water corrections were not necessary.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclides (^{137}Cs and ^{60}Co) detected in the borehole, naturally occurring radionuclides (^{40}K, ^{238}U, ^{232}Th [KUT]), a combination of man-made, KUT, and dead time, and total gamma plotted with dead time. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, casing corrections, or water corrections. A repeat log section is also included. In addition, a comparison plot of RLS spectral gamma data collected in 1995 by Westinghouse Hanford Co. and the current SGLS data is presented.

Results and Interpretations:

^{137}Cs and ^{60}Co were the man-made radionuclides detected in this borehole. ^{137}Cs was detected at a few sporadic locations in the borehole near its MDL of approximately 0.2 pCi/g. ^{60}Co was detected at a depth of approximately 230 ft near its MDL of 0.05 pCi/g.

The comparison plot of the RLS and SGLS data shows ^{137}Cs and ^{60}Co contamination detected in 1995 and 2003, respectively (RLS concentrations are decayed to the date of the SGLS logging). The total depth of logging was 8.0 ft greater for the RLS than the SGLS. The ^{60}Co and ^{137}Cs measured by the RLS, except for depths between 239 and 242 ft and at 244.5 ft, are below the current SGLS MDLs for ^{137}Cs and ^{60}Co and

should be considered suspect. ^{60}Co is detected in the above depth intervals at concentrations of approximately 0.1 pCi/g.

There are notable changes in the KUT and total gamma logs. Relatively high concentrations of naturally occurring ^{238}U are indicated between 51 and 63 ft in depth. The driller's log (Ledgerwood 1993) indicates a coarse sand near this interval and may be a medium where radon is migrating and collecting in the formation. An interval between 190 and 208 ft indicates relatively low KUT concentrations. The driller's log suggests "a brown clay and some gravel and caliche" in this interval. The early Palouse soil (161 to 190 ft) is identified by a 0.3-pCi/g increase in the ^{232}Th concentration and a 75-cps increase in total gamma count rate.

The repeat section indicated good agreement of the naturally occurring KUT. Radon may affect the repeatability of the ^{238}U between 50 and 55 ft where logging runs were conducted on separate days.

References:

Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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[1] GWL – groundwater level
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable

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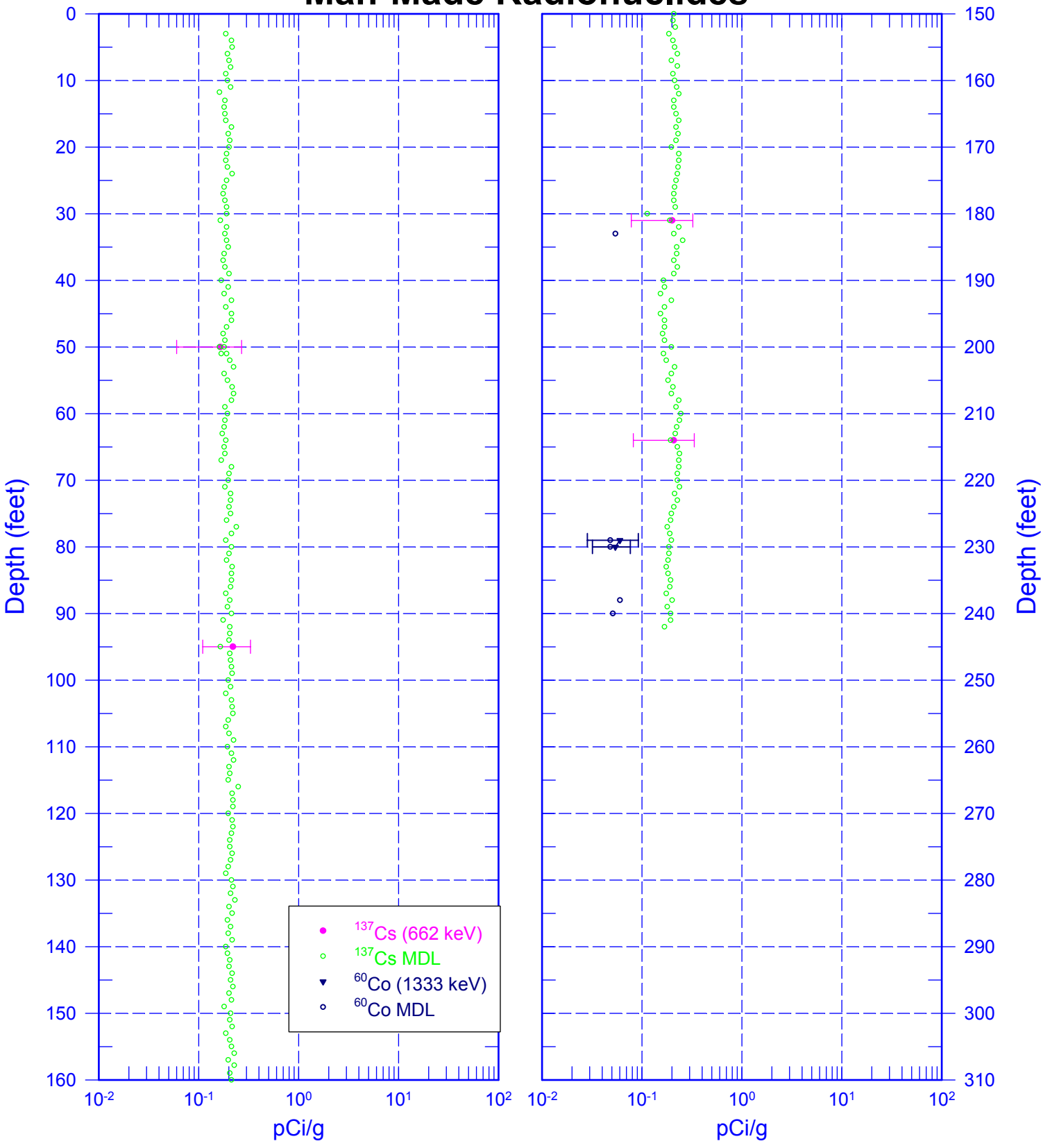
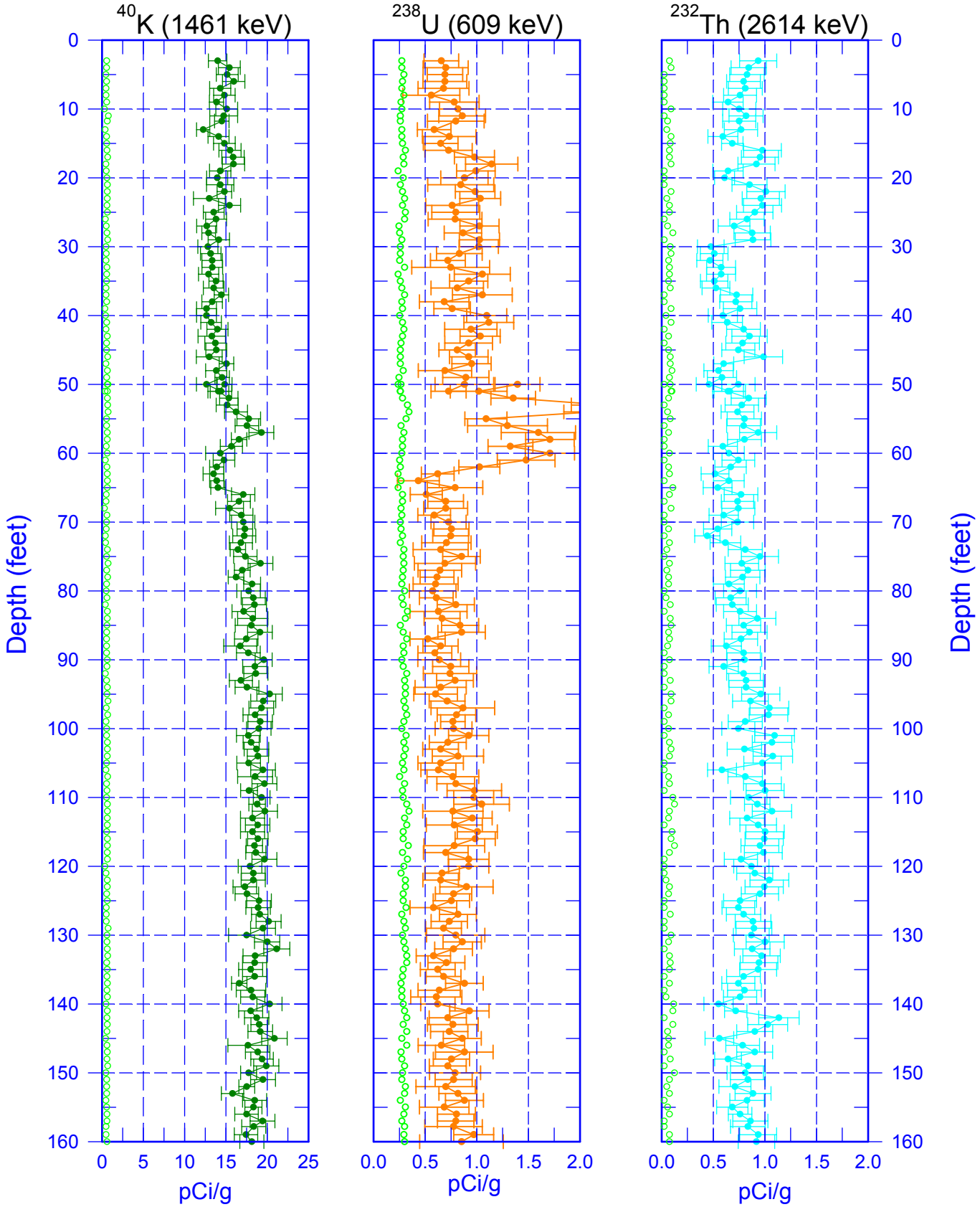
Man-Made Radionuclides



Zero Reference - Top of Casing

Last Log Date - 07/02/03

299-W22-23 (A7874)
Natural Gamma Logs

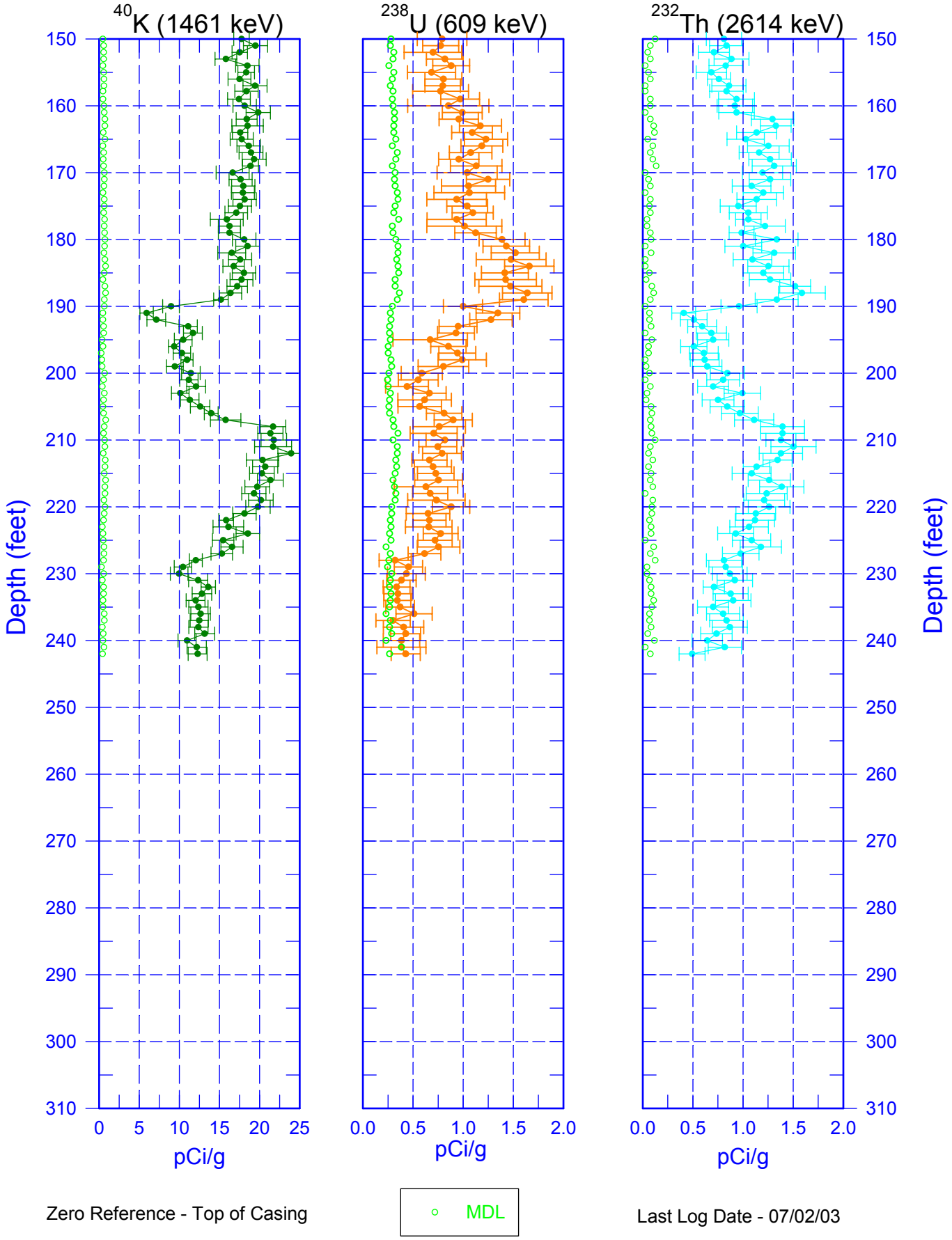


Zero Reference = Top of Casing

MDL

Last Log Date - 07/02/03

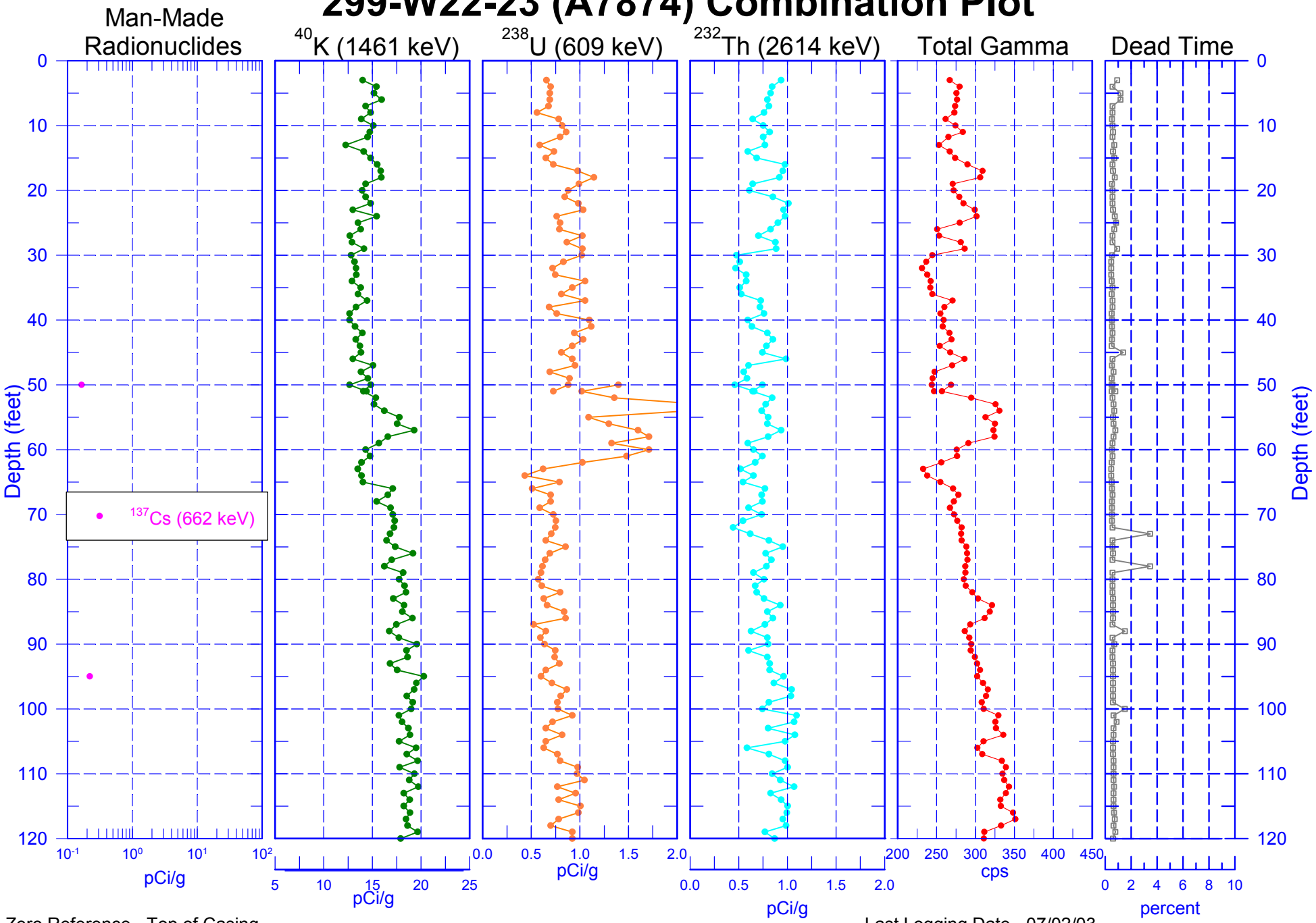
299-W22-23 (A7874)
Natural Gamma Logs



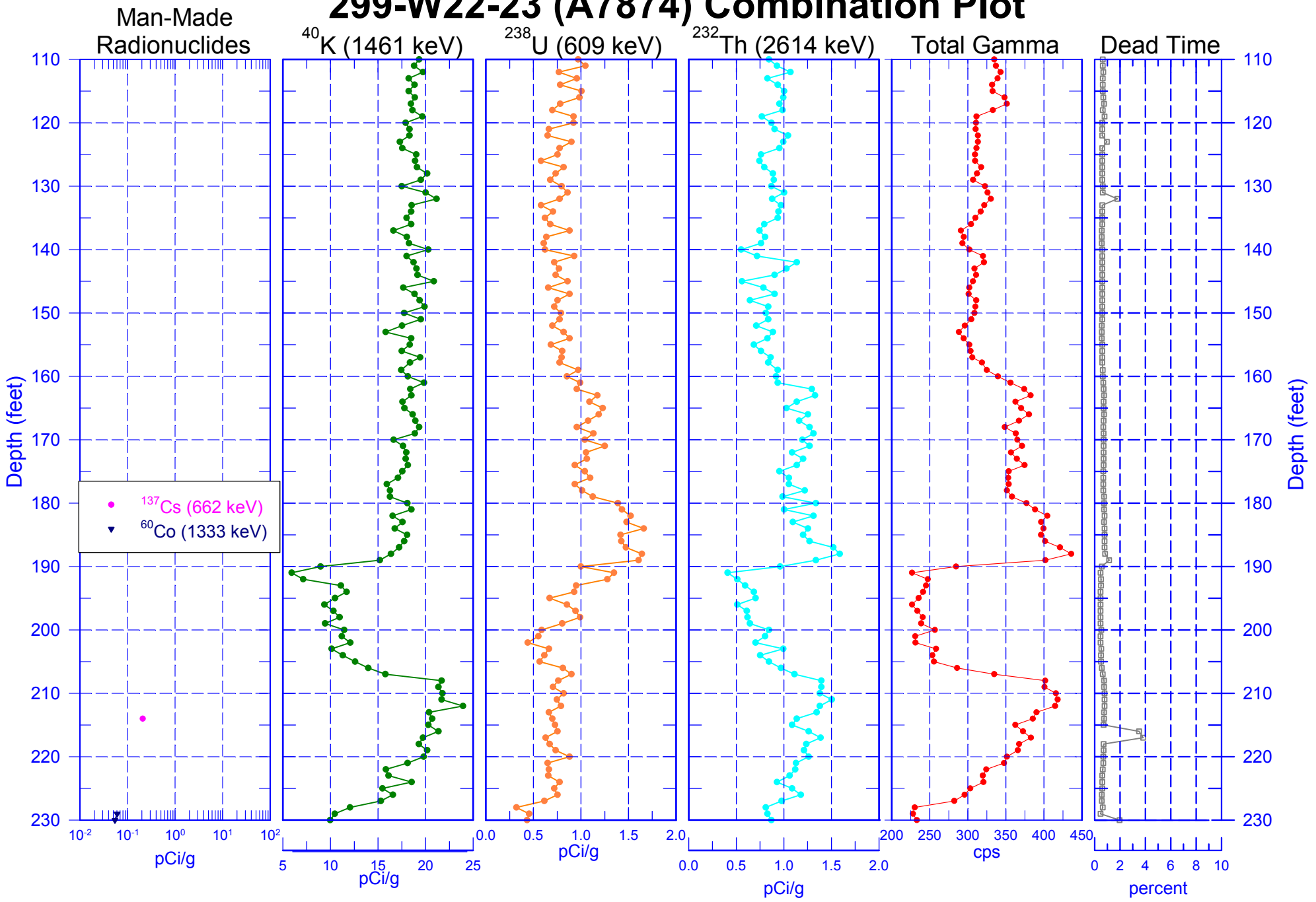
Zero Reference - Top of Casing

Last Log Date - 07/02/03

299-W22-23 (A7874) Combination Plot



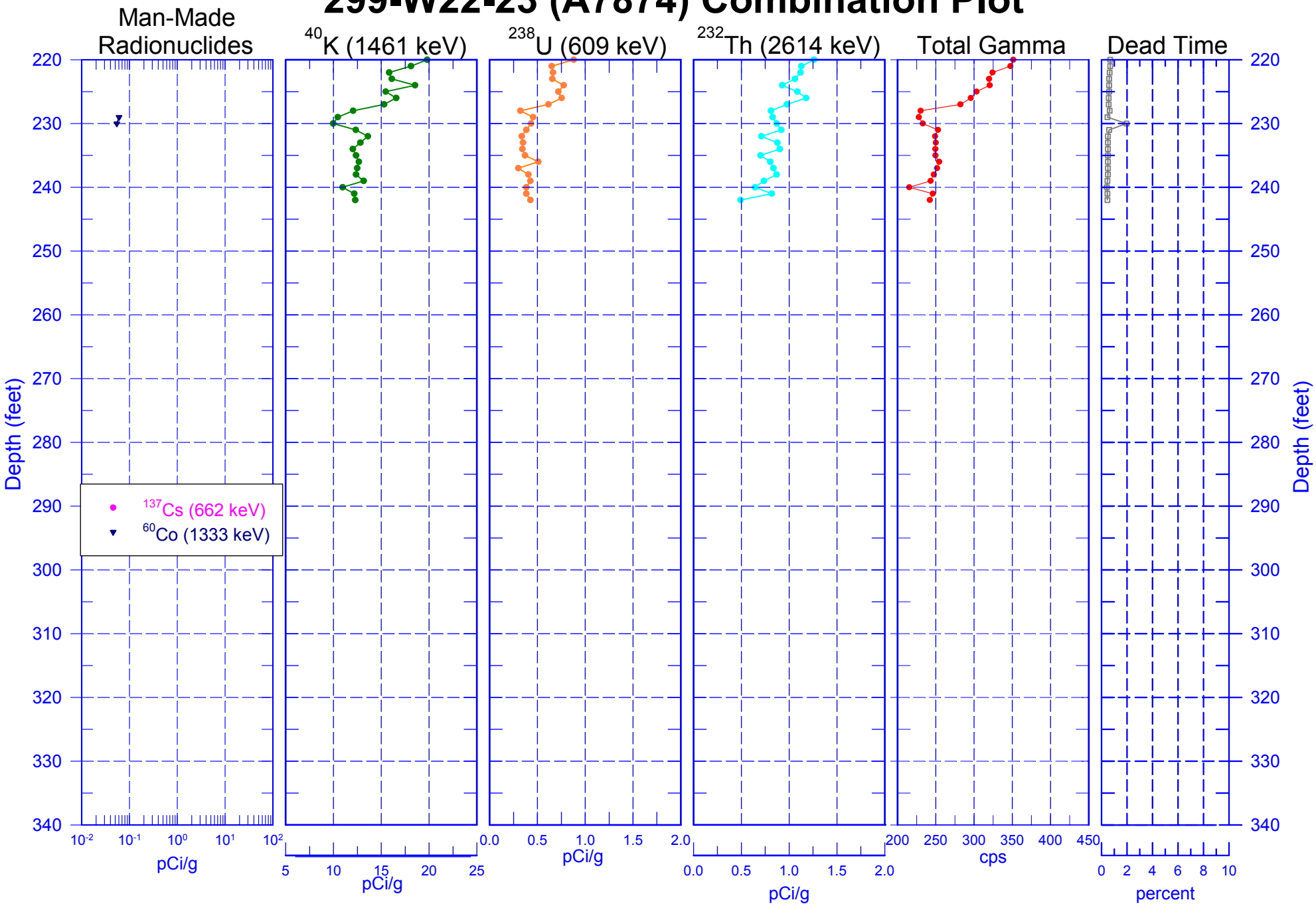
299-W22-23 (A7874) Combination Plot



Zero Reference - Top of Casing

Last Logging Date - 07/02/03

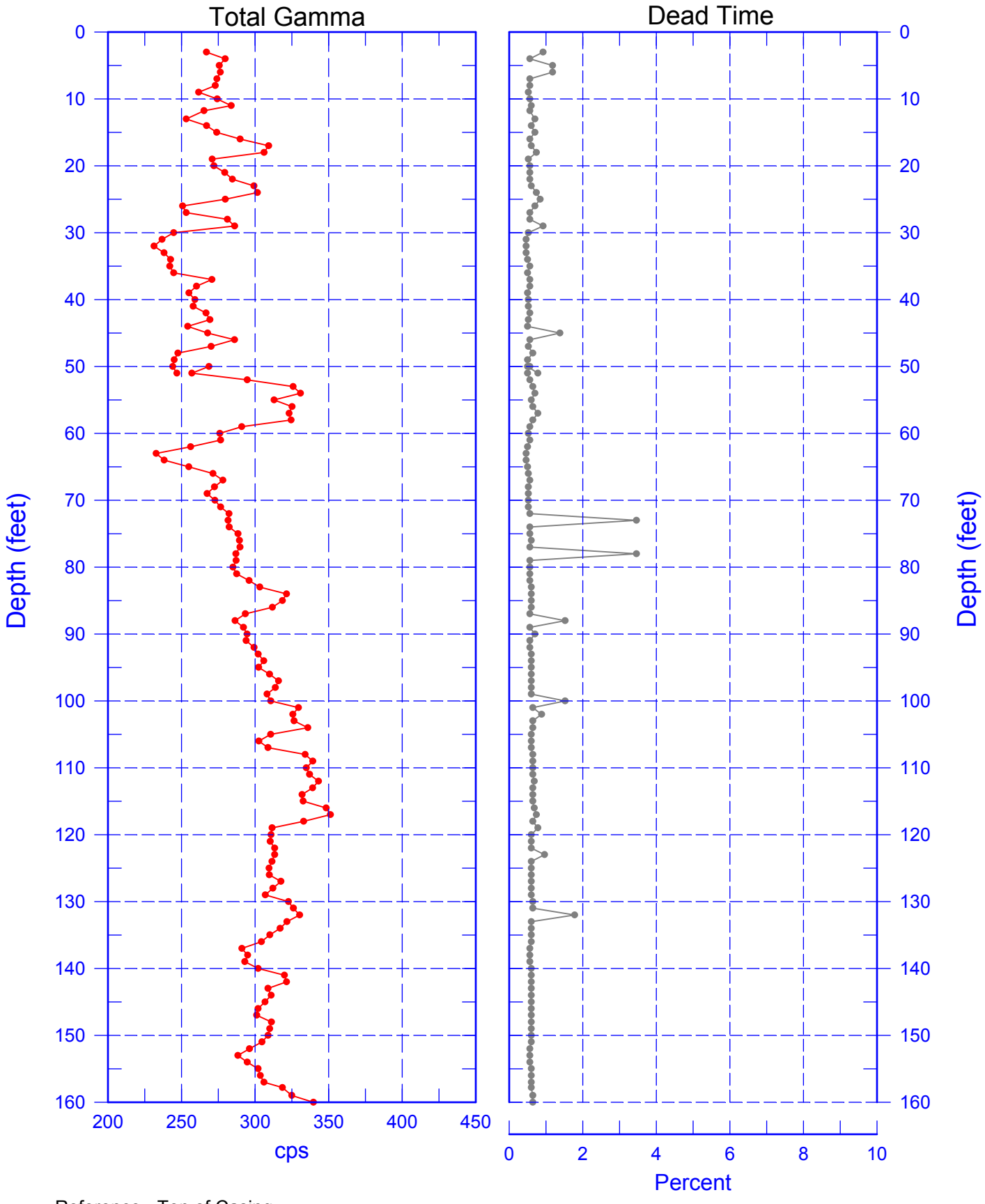
299-W22-23 (A7874) Combination Plot



Zero Reference - Top of Casing

Last Logging Date - 07/02/03

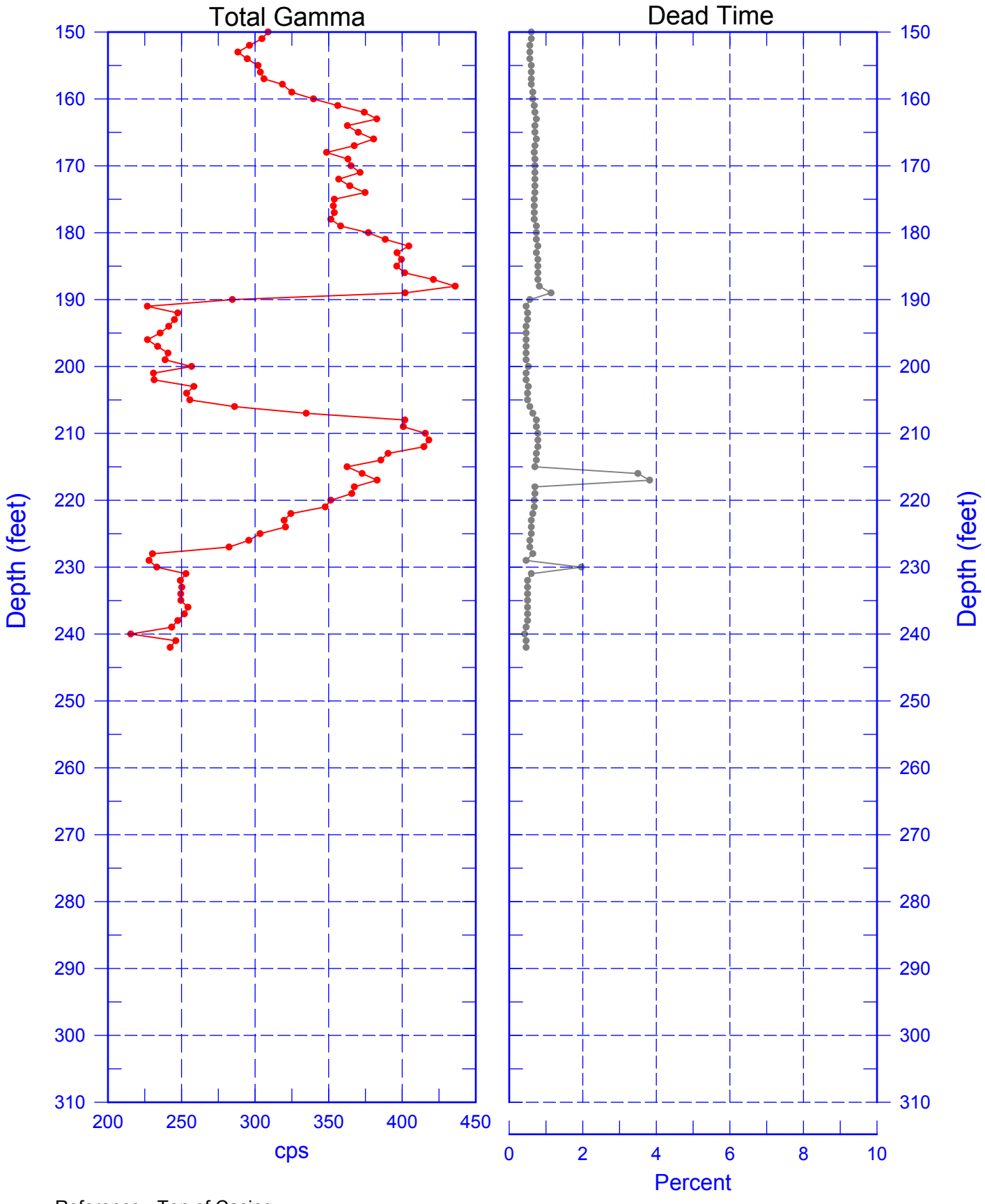
299-W22-23 (A7874)
Total Gamma & Dead Time



Reference - Top of Casing

Last Log Date - 07/02/03

299-W22-23 (A7874)
Total Gamma & Dead Time



Reference - Top of Casing

Last Log Date - 07/02/03

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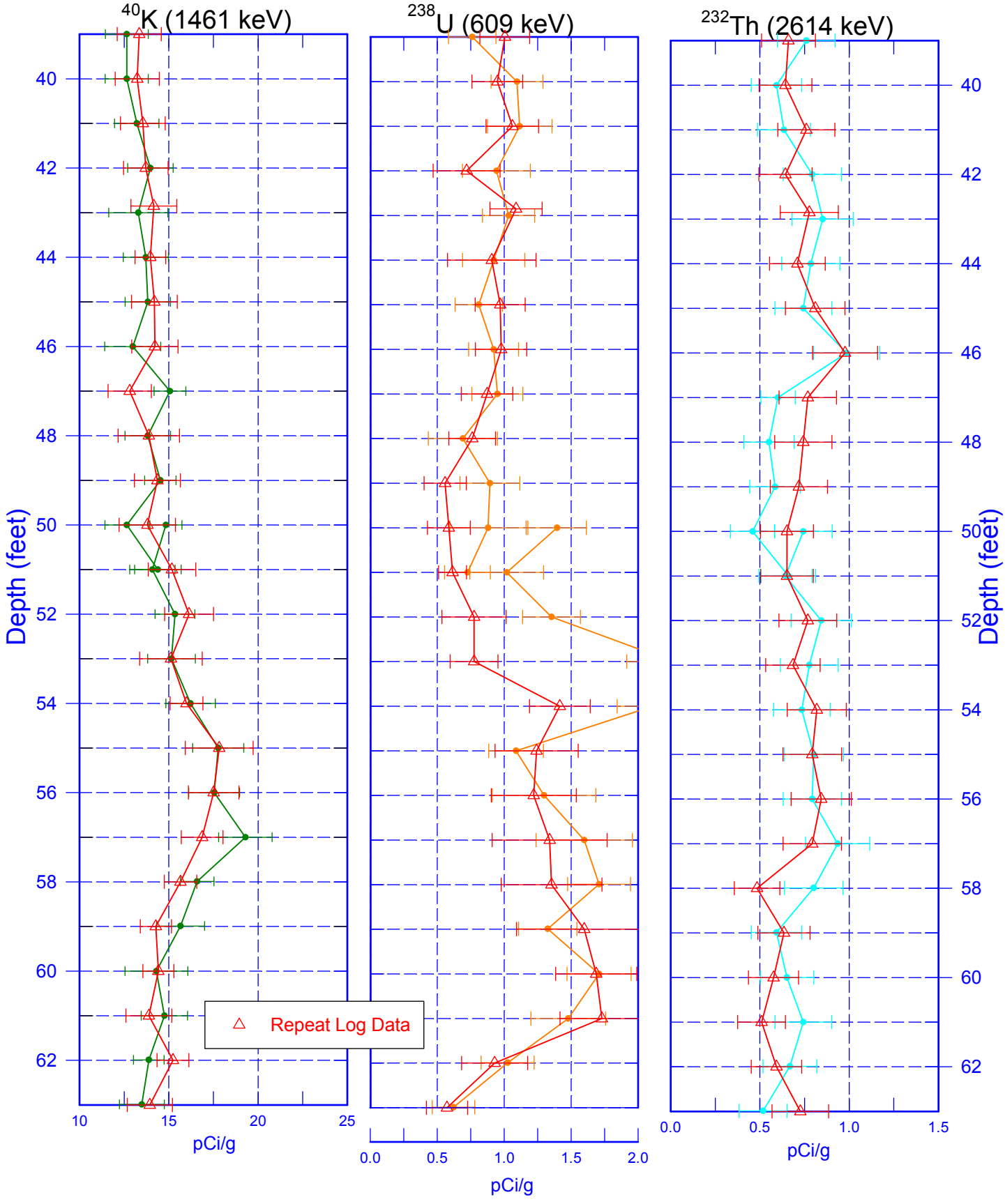
Repeat Section of Natural Gamma Logs



Zero Reference - Top of Casing

Last Log Date - 07/02/03

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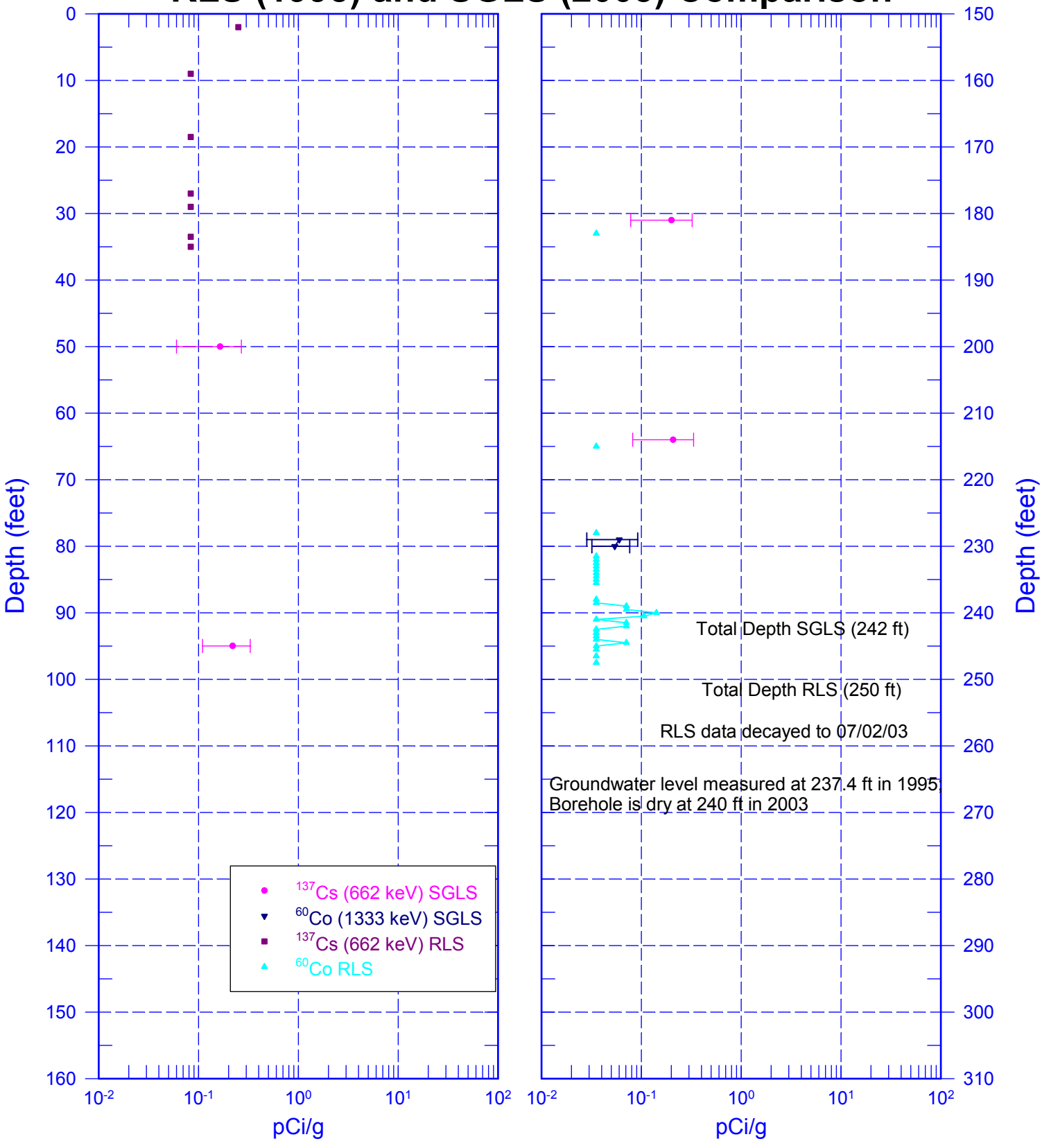
RLS (1995) and SGLS (2003) Comparison



Zero Reference - Top of Casing

Last Log Date - 07/02/03